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NATIONAL BROADBAND PLAN WORKSHOP

BENCHMARKS

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P R O C E E D I N G S

MR. STOCKDALE: The purpose of this workshop is to explore various metrics or benchmarks, as required by Congress, and for evaluating the various dimensions of broadband across geographic areas and across time.

These benchmarks may include such metrics as measures of broadband deployment and adoption, measures of speed and quality of service, and measures of competition.

These benchmarks can be used to chart our progress over time, as well as to identify areas where additional efforts are required.

We have a distinguished panel here today to offer their important thoughts -- their thoughts on this important issue.

They are Gregory Rosston, Richard Clarke, Scott Berendt, Harold Feld, Catherine Sandoval, and Jon Eisenberg.

In addition, joining me on the panel as questioners are Jon Peha, Chief Technologist at the FCC; Nicholas Maynard, Economic Research

Manager of FCC's National Broadband Task Force; and Kenneth Lynch, Industry Economist in the Wireline Competition Bureau's Industry and Technology Division.

I will provide a brief bio for each speaker just prior to his presentation.

But I referred the audience to the agenda on the broadband.gov web site for a more detailed, but still abbreviated bio of each of the speakers.

I ask the panelists to limit their initial comments to 10 minutes, please, so that there will be sufficient time for discussion and questions.

After the presentations, FCC staff may ask him questions, and then we will take questions from the audience, both those physically present in this room and those watching on the Internet.

And I have been asked to note that it is also possible to submit questions via Twitter.

Okay. So our first speaker today is Gregory Rosston.

Professor Rosston is the Deputy Director of the Stanford Institute for Economic Policy Research and the Deputy Director for the Public Policy Program at Stanford University.

He is also a lecturer in Economics and Public Policy there.

Greg, earlier in his career, served as Deputy Chief Economist at the FCC, during the implementation of the Telecommunications Act of 1996, where I had the pleasure of working with him.

Greg earned his Ph.D. In Economics from Stanford. And, Greg, please go ahead.

MR. ROSSTON: Thank you for having me, and I especially want to thank Don Stockdale for the years of hard work that he's done at the FCC as an exemplary public servant. I don't need that because I'm from Silicon Valley, and I don't have PowerPoint slides.

The FCC has an important task here of providing this broadband plan to Congress. In my short presentation, I want to talk about three

issues regarding the overall topic of benchmarks, which is sort of an amorphous title that we were given.

International comparisons can be useful, but they can also be misleading. It's important to understand the benefits of broadband, and third is that costs are also an important factor to consider.

And benchmarks, as someone told me earlier today, could benchmarks are good. They're -- benchmarks are useful if it's done in an appropriate way, and what I wanted to do is sort of put together a framework for what can and should be measured compared, and more importantly what we can learn from different benchmarks.

So just in context, we're talking now in this country about healthcare, and everybody thinks more healthcare is better, more broadband is better.

We're talking about this unfortunately in -- we don't focus -- we don't have an attempt, so far as I can see in this broadband debate,

about how to quantify the benefits and costs of broadband. People say broadband is good. More broadband is better, and that's great.

But we also need to know how much does it cost. I think more broadband is better, and it would be good to have more of it, but I want to make sure we understand what does it cost and how to do it.

One of the hot button issues in this debate has been international comparisons and ranking of the U.S. in terms of how do we rate internationally in terms of broadband adoption.

What -- thinking about these comparisons, we have laboratory in the United States. We have 50 different states and the District of Columbia, and we have a lot of learning and benchmarks that we can do from this laboratory of the states.

As an academic, I, you know, have to resort to citing my own work. Recently, I've completed a SIEPR discussion paper with Dan Ackerberg, Mike Riordan, and Brad Wimmer where we

looked at low- income and lifeline telephone programs, and we have data on 7,000 different wire centers. And we look at what are the important aspects. We note that there are differences in the adoption of telephone by low-income people in different things, but we don't just stop there and say, "Well, there are differences. Let's provide a table."

It's what are the different programs that exist in different states and what are the things that drive adoption?

Using this -- so one important factor that we found was transactions costs. States that have automatic enrollment in lifeline and linkup plans tend to have higher penetration rates among low-income households, even though as they don't necessarily take it -- take the lifeline and link up programs, but these adoption programs and transactions costs are an important factor.

If we can use benchmarks to figure out what is driving the different adoption rates, that's a good way of using these, not just

providing a list.

So while our study is detailed and sophisticated econometrically, simple headlines comparisons still can be very powerful, like in the space race when we were behind the -- behind Russia, it caused something to happen.

The question is should you cause something to happen just because of headlines, and I don't think that we necessarily should try to do something more because we're "behind," but we should find out what we can learn about why we're behind and what factors will affect it.

So adoption is one measure that you can -- something you can measure, and it's been focused on because it's easily measured, it's easily understood, but does it tell us anything?

So, first, what you'd want to do is try and figure out what policy answer you'd want to come up with.

The way to think about this requires a number of steps. First of all, assessing where do we stand in this, and not necessarily comparing us

to other countries, but maybe absolutely is it right for our country.

Second, what benefits would come from program to accelerate our position more than it would change from normal government (inaudible) and market changes.

Third, what are the costs of those changes? And fourth, can we justify those costs from a societal perspective? Who would pay? What are the different changes that would occur because of that?

So, we have right now -- the United States ranks differently depending upon what measure you use internationally. And I want to focus -- just a minute to talk about the international comparisons I've seen.

The OECD, which a lot of people cite, has the Internet penetration per capita of 26 percent in the United States.

Well, if you're -- if every household were like mine, and we have four people, that would be great because then we'd be at 100 percent

penetration.

But because four people share one broadband line in my house.

So the OECD has been criticized for this fact that they don't take into account households.

PointCast provides some data that looks at household penetration, and they have a huge number of countries where they provide penetration rates per household. Unfortunately, they don't have household broadband; they just take broadband lines and divide by households.

Scott Walston has taken some other data -- point topic as to closer to 75 percent. Scott Walston has done some work on a series of trying to figure out what about residential penetration per household incomes -- he uses for the United States John Horrigan's Pew and Internet American Life Survey, so I assume that the Commission has access to this data that shows it's basically about 63 percent of households.

You know, as a side note, when you look at these international comparisons, we need to

make sure that there are margins of error in all of these surveys, and I've never seen anybody mention or stress that these things need to be taken with a grain of salt on that.

But the rankings are not an end of themselves. It's -- you need to think about -- well, what does it cost -- what would happen -- what could happen -- first of all, how far behind other countries are we? If we are six months behind, is that making a difference in our competitiveness?

How does -- if we're thinking about comparing with other countries, does our comparison with other countries think of -- do we need to compete with them on a household level or is it on a business level -- for consumer goods or on business side.

So we need to think about how do these things affect it and what are we trying to do. The -- then once you have these measures, you need to think about both benefits and costs.

So starting with benefits, there are two

kinds of benefits that you can think of -- private benefits and public benefits or externalities.

In addition, some people might argue that there is a societal right to access. So, for the moment, I'm going to assume a fixed notion of something called broadband, and even with that, things are complicated to measure. It gets harder with different gradations of broadband, and I'll come back to that at the end.

Private benefits are relatively straightforward. What are people willing to pay for broadband? And then, if you think that there's some people who can't afford it, you want to deal with those with income transfer programs.

Most economists would want to have a -- you know, trying to get these private benefits to try to reduce the price and increase the quantity. And that way, you'd have higher consumer surplus.

There are two particularly good analyses of broadband benefits. Savage and Waldman have a study from 2002 to show the increased value of broadband, and then Greenstein and McDevitt have

also looked at the incremental value of broadband.

These numbers are much smaller than most people have come up as a value of broadband, in part, because they don't look at the externalities of broadband. Unfortunately, no one has really come up with a good way to analyze the value of the externalities from broadband.

I think that's an important area of research, especially if people are going to try to justify the expenditures based on externalities, we should have some idea of whether these externalities are big or small or real or imagined.

So finally one other thing is that -- I think we have a feedback over there -- thinking about general purpose technologies as an externality, that Tim Bresnahan at Stanford has come up with this idea called general purpose technology, like electricity drives a lot of other innovation.

The Internet and broadband may be a general purpose technology, and it's difficult to

figure out the value of that.

But it's important to think about that when you're trying to measure costs and benefits. The cost side is what are we trying to measure here? What are the costs of broadband? What are the costs of extending broadband to different areas? It's going to be a different cost in different areas.

I got a group together of 71 -- or a bunch of us got a group together of 71 economists who submitted comments to the NTIA and Rural Utility Service as part of the broadband stimulus package, trying to get them to use reverse auctions -- Dennis Weller's in the audience who should -- who was part of reverse auctions initially for universal service -- to minimize the cost of per new subscriber added, to try to figure out how can you make benchmarks between a system in rural Texas versus one in rural South Carolina?

Well, the best way to get a benchmark in my mind is to have a competitive benchmark, and you had these different areas compete against each

other to get subsidy funds by agreeing to accept the least amount of subsidy.

Finally, I want to I guess is that we need to think about how do we pay -- if we want to increase -- if we find that the benefits of benefits of broadband do outweigh the costs, how do we then determine a reasonable and efficient way to pay for it?

Benefits -- benchmarks should be -- basically, in the end, benchmarks should be used to understand what factors in the market are not working and how policy can be more effective.

It's not from simple adoption horse races, but from ways like our paper where you can look at what factors will increase broadband at the least possible cost.

So I haven't been able to have time to address other important issues like businesses versus residence in terms of measuring prices, speed, latency, and other things and how different pricing plans can be compared, but I think those are important issues, and maybe we'll get to those

in the Question and Answer period.

Thank you very much for having me.

MR. STOCKDALE: Thank you, Greg. Our next speaker is Richard Clarke. Dr. Clarke is the Assistant Vice President, Public Policy at AT&T, where he is responsible for AT&T's economic and competitive public policies for telecommunications.

Since joining Bell Labs in 1986 -- you did yourself there, Rich -- Dr. Clarke has worked on almost every area of telecommunications regulation.

Dr. Clarke earned his Ph.D. In Economics from Harvard. Rich?

MR. CLARKE: Okay. Thanks, Nick and Don for inviting me to speak on how to benchmark broadband.

Benchmarking and indexing are the art of taking a lot of data and condensing it into a small set of parameters that are easy to follow over time or over different geographical regions.

But for broadband benchmarking to be

useful, it's essential that these benchmarks reflect accurately the clear policy goals of the Commission, not just to ensure their relevance in the whole process that's being undertaken to develop a national broadband policy, but also because you can expect providers to teach to the Commission's test.

So if you set out a wrong benchmark, you may get wrong performance as a result. But second, it's also important that the policy goals selected the related directly to U.S. customer welfare.

As Greg has noted, attempting to align U.S. Benchmarks with benchmarks adopted in foreign environments should be approached with great caution. As the example pointed out, the OECD's benchmark for measuring fixed broadband penetration is lines per capita. But fixed broadband lines typically serve a complete household, and households in the U.S. are generally larger than those in other OECD countries.

But also household sizes vary greatly across the different United States, with household sizes in Utah exceeding those in the District of Columbia by roughly 54 percent.

So if you want to accurately measure or benchmark the U.S. against worldwide performance and penetration or benchmark the performance of individual states against each other, it's essential that you probably not use per capita penetration because it probably could be rather misleading.

Similarly, the ITU's benchmark for a country's network capacity is its quantity of international bandwidth per domestic user. Not surprisingly, Luxembourg is the champion of this measure, as few content providers cited economic to locate servers within Luxembourg to service its relatively small domestic market.

In contrast, the U.S. is a laggard in the ITU's ranking because the immensity of its market makes efficient pretty much for every content provider to serve U.S. demand from

domestic caches rather through expensive international bandwidth.

Finally, it's important that goals be brought in stable. This is essential to ensure the relevance of the benchmark overtime, and to avoid the inaccuracies that may result from excessive granularity.

After setting goals, the next step is to choose specific benchmarks. These appear to fall into three general categories. Is broadband available? How does it perform? And what is its price?

While availability may be the simplest of these to measure -- is it just a yes or no answer -- but availability over what geography? We're all familiar that availability at the five-digit ZIP code level has been criticized for as being too vague, while data at the individual street address has been criticized as being more inaccurate and perhaps too burdensome to handle.

But the most complicated aspects of broadband benchmarking are likely to be in the

indexing of the performance and price of available broadband services.

The reason why broadband performance is an important but difficult characteristic to benchmark is because different broadband uses they have very different network performance requirements. This chart illustrates the mix of network capabilities needed by a few of the more popular web applications and how they can vary greatly across different of these web applications.

So how should we measure broadband performance? Well, it often seems that speed is the only characteristic mentioned when describing broadband capability, more particularly the speed is used as a shorthand for what I would call advertised maximum potential download speed in the last mile access link, there are many other important performance components for broadband.

Not only do these include the multiple flavors of speed -- are you talking about upload speed, download speed, the maximum, the minimum,

an average, how sensitive is it to time of day variations and the like, but also how much monthly bandwidth do people need to use. Is this bandwidth required to be used in the peak period or off- peak period? Is it upstream or downstream? What's the latency required in performance of the network? What's its packet loss and jitter?

All of these things can make very big differences in the effectiveness or the capability of your broadband line to support particular applications that you may wish to use.

But there's a limit to how many different things you can benchmark. These characteristics are broadband can be very numerous and their performance is often sensitive to particular customer usage patterns and particular neighborhoods at different times of day. It may vary a great deal. Collecting average figures over a day may hide important details that it becomes very complicated just to say well, I just want to make the longest was possible of

performance characteristics, and I'm going to benchmark them, each one of them, individually.

So often what people think of is that instead let's create an index of these performance characteristics, but this is challenging in itself because different users may have different relative values or weights for different of the performance components.

You need to determine these weights, and that these weights need to remain stable over time in order to have an effective index. Another possibility, or solution to this problem, is to let consumers determine for themselves the relative importance of different broadband performance components and measure their implicit scoring of how well Broadbent performs for them by conducting a poll of their satisfaction as opposed to asking how they feel about each component.

Finally, we come to price, which has to be a record, given an economist takes almost to his last slide to deal with this issue.

Price itself has many different

attributes. How you should measure price depends on the policy goal for the benchmark. Is it to measure the affordability of a minimum defined broadband service? Or the price paid for a particular state-of-the-art technological capability?

Are we looking to find out what the price is of the best by service in a market? The average by service in the market? Or maybe the worst deal in the market?

The list is fairly long as to how many different price measures one can develop and each one can have a very different purpose and usefulness to the Commission.

Okay. Another thorny issue occurs because broadband service is most commonly produced in conjunction with other services such as PSTN, voice or cable television. So what's the most relevant price? Is it what I'll call the standalone price if you buy, you know, what people commonly -- naked broadband service? Or is it an incremental price where you consider bad than to

be part of a double play, where perhaps DSL is bought in conjunction with PSTN voice or cable modem service is bought as an add- on to cable television service?

Or is it part -- the incremental price is part of a triple play, where all three of these services are combined together?

When you look at this total bundle price perhaps that's the most accurately measured item because commonly -- or it's rather common in the U.S. for people to consume all three of these services and given the cost complementarities between them, you know, that that might be the most useful or most accurately measured parameter.

I'll note that a number of the ways in which price has been measured have some very significant difficulties with them. For example, the OECD's current practice for indexing broadband prices is to report an unweighted average price for a rather idiosyncratic or eclectic collection of plans that the OECD decided to sample off of company websites, and not to adjust the different

prices for each one of these plans, but the actual sales popularity of the plan or of the provider's market share within the country.

Furthermore, their current practices they don't adjust for performance differences between plans, such as differences in speed or bandwidth usage limits, overage fees, or other features. They are proposing to reform this in some upcoming price index reports they put out, but they have not done that so far.

Finally, price comparisons that are reduced to U.S. dollars at purchasing power parity per advertised megabit of speed. This latter practice tends to lionize the highest advertised speed services over lower advertised speed services, as well as services that were bought in western and northern European markets over those purchasing the Americas because of their idiosyncratic exchange rate that they use.

Finally, any benchmarking process must -- finally, any benchmarking process must recognize that customer preferences change over

time, often rapidly, and you need to -- it's a continual trade-off between maintaining a benchmark for a consistent historical record versus the measure a cheap and of current customer demands.

The key to making broadband benchmarking effective is to keep the index broader scope so that it remains relevant for a reasonably long period of time. Thanks very much for your attention. I look forward to the question-and-answer period.

MR. STOCKDALE: Thank you, Rich. Our next speaker is Scott Berendt. He is the Director of Research, Evaluation, and Documentation of One Economy Corporation, a global non-profit organization focused on maximizing the potential of technology to help low-income people improve their lives and to enter the economic mainstream.

Prior to his time with One Economy, Scott worked for the U.S. Geological Survey, and served as a Peace Corps volunteer in Mali, focusing on agricultural and community development

issues. Please go ahead, Scott.

MR. BERENDT: Thank you. And I appreciate the opportunity that the FCC's presented to be here today.

For starters, what we at One Economy believe should be a part of the benchmark process as a result of the National Broadband Plan is to create what we're calling a broadband progress board. This board would be chaired by the FCC, FCC personnel, and would consist or would be advised by Perry's government agencies, which can include Commerce, Department of Education, Department of Energy, HHS, HUD, various other agencies that are involved -- oh, thank you -- that are involved with broadband issues.

In addition to that, it would include key nonprofit organizations, possibly private-sector entities or their various associations. The intention of the Broadband Progress Board would be to implement and monitor the National Broadband Plan and to focus on the establish benchmarks and performance measures that

have been handed down.

Furthermore, it would be their true form, shape policy directives, increase supply and demand, promote public-private partnerships, drive innovation, and ensure that broadband is affordable, available, and adopted.

All right. Some of the key goals that we feel should be met by 2013 or sooner -- now you'll see some dates that are at the end of some of these suggestions. These we don't feel are necessarily written in stone, but we feel that if there's no set date initially, then it just gets pushed farther and farther to the side. Some of these include affordable broadband that's available to 100 percent of the country, a national digital literacy initiative, fully funded; ubiquity of online public purpose content and applications.

Today, we focus on putting broadband in the home. In 2013, we feel that it should be on the person, where wireless would play a significant role.

All government services online and used as an adoption lever, pushing people towards using broadband versus standing in line. They'd be online.

Fully digitized national emergency network. All public and affordable housing wired or enabled for broadband. We say here 100 Mb per second or greater in all educational institutions, health and public safety facilities. Now the speed -- others may have it at a lower rate, which if we would certainly would defer to people who have greater expertise in this area then we at One Economy do, but certainly the intention is that these facilities need to have high-speed and very robust broadband capabilities.

Mobile computing devices available to K through students, and as it's been discussed here a little bit about availability and adoption and what we feel is key to these components is that there's a -- along with the ubiquity in usage, that there's also utility, that public purpose content that we provide at One Economy and that

other entities could contribute to is information and resources that drive people to action.

So it's not just a passive experience, but something that broadband can help motivate individuals to engage and improve their lives. And at One Economy, with our focus on low income and underserved populations, these are areas that certainly could benefit from the capabilities and capacity of broadband that has not yet been realized.

Some of the tools and methods that could be implemented to achieve these. Certainly is the FCC Form 477 could be leveraged, the information there. Asset mapping and consumer assessment service, civic participation, town halls, on-lone crowd sourcing. These areas would fit into the design of the Broadband Progress Board as well, where it determines within the communities themselves what is not just available double what their needs are, what their wants, their capabilities, how they want to engage. So it creates a feedback loop that would enable not just

a fixed approach, but a continually evolving situational analysis of what's going on within these communities and how to adjust and incorporate the needs of these communities that could benefit from broadband adoption.

With that, I'll cede the rest of my time --

MR. STOCKDALE: Sure.

MR. BERENDT: -- and open it up. Open it up for questions in the question and answer period.

MR. FELD: I get to do an extra five minutes. As I'm the lawyer on the Panel, so I'm going to take more time. But --

MR. ROSSTON: And not get introduced.

MR. FELD: -- yes.

MR. ROSSTON: You mean it be a lot to be introduced or not?

MR. FELD: (Inaudible) it's done.

MR. STOCKDALE: Okay. Our next speaker is Harold Feld, who is the Legal Director for Public Knowledge. Before joining Public

Knowledge, Mr. Feld, worked as Senior Vice President of Media Access Project, and prior to that he was an Associate at Covington Burling, where he worked on Freedom of Information Act, Privacy Act, and accountability issues.

Mr. Feld also writes Tales of the Sausage Factory, a progressive blog on media and telecom policy. Mr. Feld.

MR. FELD: Just let me start by saying a few things. One is you will pick up some common themes in what I'm going to say from each of the preceding speakers, in that these are hard problems. And the information gathering is hard. Figuring out how to measure is hard.

Let me start with a difference, though, between benchmarks and goals which is critical here.

Goals are what we ultimately want to come out of the National Broadband Plan, and, you know, being a lawyer, I go back to the statute and, you know, the statute says, well, you know, you're going to create a National Broadband Plan,

which will have metrics, okay, and benchmarks, okay; and to do a whole bunch of things. So the statute has given us a whole bunch of very broad goals.

Benchmarks, as I understand in the context of this statute, and, you know, there's a lot of different ways to interpret it, but at least as I understand here is the stuff we have to measure the progress of the National Broadband Plan so that we can know that we're on track. We know we're moving in the right direction, that we're not going to wake up five years from now and be surprised that we have achieved our goals or that our goals are wildly off course or that our methods are wildly off course from where we want to end up.

So in looking at this problem of benchmarks that we are required to create under the statute, they are, as some others have already said, have to be informed by the goals of the statute.

And the goals it here are amazingly

broad and complicated. It's universal, affordable broadband use to its maximum utility, whatever that means, that has impact in advancing consumer welfare, civic participation, public safety -- essentially every sector of our lives.

So in order to benchmark this properly, we need to understand not just a broadband market, but a broadband ecology. This is not just a simple producers-consumers price analysis. To do what the statute is telling us to do, we need to know how it is impacting an extraordinarily complex system, us, with a whole bunch of different community stakeholders and providers in every critical aspect.

That's a tall order, and it's very intimidating. And the problem is the temptation when confronted by something that large and intimidating is to draw back into go to what we know, which is to look at very narrow kind of metrics about the broadband market, except that that may technically comply with the narrow reading of the statute, but it will fail.

It will fail miserably. It will -- we will end up where we are after the last broadband plan, which was in 2004, when we had a plan -- we'll have universal broadband in 2007, and in 2007, we declared, hey, we have it.

So that didn't work out for us here well because we are still here trying to figure this out.

So as we move forward, we need to be willing to grapple with the hard problems.

Now the problem is I could recommend a couple of specific benchmarks based on what I think the goal should be, but I don't think that's useful to do at this point. And I want to cover a -- in a very short time here just a very limited -- what are some of the aspects of this ecology we need to focus on, how do we get all the information we're going to need, because it's a hell of a lot of information that we have to bring in and process, and how should we set this in terms of dynamic versus non- dynamic benchmarks, and I'll explain what I mean by that in a minute.

I identify in this paper here three particular areas to focus on -- traditional last mile, the criterion we've mentioned, direct price to consumers and small business, speed, capacity, congestion, and then there's middle mile, because if you don't have an idea of what the middle mile capacity is, and you don't have as part of the National Broadband Plan how you're going to have a middle mile that supports your last mile, then it's not out of work, because I can have great "broadband" within a community, and if there's no one to do backhaul for it, then it's a intranet. It's not part of the global network system.

Finally, there are what I call qualitative metrics, which is not what we might think of as kind of are you happy with your broadband service sort of thing. I mean covering this vast spectrum of quality of life issues that we've been talking about -- education, consumer welfare, job training, energy efficiency -- all of these things and get into the how does broadband affect our overall quality of life.

So, okay. How do we do this? Well, we actually have a lot of sources for this, and I should point out we actually in another context measure equally complex systems. We do things like the Consumer Confidence Survey. We do things like the Energy -- the Energy Information Administration does, you know, the National Energy Reports or a monthly or sometimes weekly basis depending on sectors. So this is not impossible. It's just hard.

One of the places that we need to go is to move away from the traditional FCC approach of relying on notices of inquiry and explicit solicited comments because those can generate very useful things, but they're really not good for what we need, which is a lot of accumulated, real-time data that can be brought in, processed, cut in different ways and to the extent possible shared with the public, because the more people who are working on this, the better off we will be.

One source is consumers themselves, the

people who are actually using this. Crowd sourcing was mentioned. I will also add we could generate applications that track this stuff. Now I'm not saying the FCC should put spyware in everybody's i-Phone to know what they're looking at, but I am saying that you could develop applications that did things like test how fast your speed is by having volunteers download an app to their laptop or i-Phone that -- or whatever that randomly pings an FCC server and random times and collects real-time data on how is the network responding.

And we could use that data, collect it on a regular basis to inform how well we are doing. That's, you know, one quick example. Automated reporting with regard to the carriers themselves is another possibility. Again, there are a lot of privacy concerns. There are concerns about proprietary information, but the fact is that we are capable of using the information mining technology that is used every day in the private sector and use that to inform the

development of policy and to make sure that we are actually on our way to using this meaningfully.

There are federal agencies out there who are also looking at this in the context of their own work. There needs to be coordination among federal agencies. There is no reason, for example, the statute says find out about economic growth. That obviously means whatever Commerce is doing to look at economic growth there should be questions about broadband and broadband utility in there and how they're gathering it. Or the FCC should be working with Commerce to determine what factors they look at for these sorts of criteria to look at themselves.

Because there are very serious problems at the FCC, it's obvious that we're going to have to make cuts on these things. The FCC is going to have to decide what's feasible, but my big advice to the FCC is don't try to do this alone. This is a national broadband plan. There is a requirement for government agency coordination. I think you'll find that a lot of state and local

governments are very interested in coordinating and working on this with you.

I think that you will find that there are a lot of individuals or consumer organizations and other organizations that are very interested in measuring this, and I daresay that even the providers themselves, while they hate, you know, those mandatory reporting forms, you suddenly want to make sure that if the FCC is collecting data, that they're collecting the right data and that it's accurate and that they minimize the reporting burden on themselves to the extent that's necessary.

The final thing I will say about trying to devise these benchmarks is there are two cuts the FCC needs to make overtime. One is a question of how do you deal with regional variation or benchmarks that are defined in terms that are really relative to specific individuals. The statute says affordable. While affordable, if you look at the HUD's definition for affordable housing is 30 percent of income.

So, you know, how do you do that for broadband? You could say, well, we'll take income level by census block or something like that and look at the price within a census block. That would be one way.

The other is to say what percentage of people's income should they be required to spend on broadband as opposed to, you know, housing or food or any of those things.

Again, lots of different cuts, and there will be questions about tractability and how you can gather the information, but these are benchmarks that are made with reference to these kinds of externalities that Dr. Rosston was talking about earlier and try to find ways to standardize these, because standardization is critical if we're going to use benchmarks to ascertain if we're on the right path or not.

But that does lead me to a last point, which is how dynamic do we want these benchmarks to be, because we're going to reevaluate them. We will discover, as we collect more data, that we

get better at this. We get more experience at this, and we can figure out the tree on the harder questions of how this is impacting our lives, what are the right things we really should be looking at that Corley would broadband. How will we know the right speed is to achieve the positive social benefits? That's something that we will only learn by experience.

And, therefore, while we must have stability are benchmarks so that we can actually be making proper progress and while there is a risk that if we revisit these things, the temptation will be to write them to conform to what's going on the ground so that politically we can declare success.

Nevertheless, we also have to recognize that in a complex system, such as this one, where we're really at the beginning of our learning curve, we must inevitably go back periodically and reevaluate where we are in light of the goal, which we set for the National Broadband Plan, which should not be altered, but we should

reevaluate from time to time are benchmarks to make sure that they are actually the ones that are properly informing our journey to those goals. Thank you.

MR. STOCKDALE: Thank you, Mr. Feld. Our next speaker is Catherine Sandoval, who is Assistant Professor of Law at Santa Clara University. At the University, she teaches mass communications regulation, anti-trust law, and contracts, and performs research, among other topics, on telecommunications and anti-trust.

Before joining academia, Professor Sandoval held a number of positions, including Director of FCC's Office of Communications Business Opportunities and Under Secretary of the State of California's Business, Transportation, and Housing Agency.

Professor Sandoval received her juris doctor from Stanford Law School. She also was the first Latina to win a Rhodes Scholarship, and she earned a Master's of Letters Degree from Oxford University. Please go ahead, Ms. Sandoval.

MS. SANDOVAL: Thank you very much. Thank you very much for the invitation to be here, and thank you all for your interest in this important topic.

So when we're talking about how do we measure broadband, one of the things that we also have to look at in terms of achieving the goals of the Act is that what the FCC has really done to date in terms of measuring broadband -- can I have -- is to lump all of broadband into one single bucket.

So in order to define broadband for the purposes of the American Recovery and Reinvestment Act and also report on broadband deployment and to identify competition issues and other issues, including gaps in service, we need to actually better distinguish between what I call as actually the different types of broadband access.

And one way of looking at that is emphasizing and examining restrictions on access that Internet service providers are increasingly imposing instead of just focusing on speed,

because the FCC to date has really had a one-dimensional measurement that is focused on speed.

And second, I also want to discuss today the need to report on gaps and Internet access, including the continuing digital divide. And as we do these various measurements of where we are with broadband, one of the things that were going to have to do is make sure that we are doing what is necessary to measure those gaps, including doing surveys and languages other than English, to capture some very important gaps in populations that are experiencing these gaps.

So the FCC has recognized the need to start with a clean slate to measure broadband. They've recognized that the (inaudible) of code methodology was deeply flawed, but we still need to move on to distinguish between really what are different types of Internet access.

So, as several of us have discussed, the FCC has really focused to date on speed, and speed does not accurately measure whether broadband services by different Internet service providers,

or ISPs, are substitutes.

And, of course, the concept of substitutes is something that's just borrowed from antitrust law, that we define the relevant product by looking at whether or not one product is actually a substitute for another.

You know, if we had more time, one thing I would do -- I've done in my classes and at other events is ask people how many of you are willing to give up access to a personal computer or a desktop computer and the Internet which is attendant to that, the Internet access that you get through that, and rely solely on Internet access through a cell phone or personal digital assistant.

So usually when I asked this question, how many of you are willing to give up one for the other and rely solely on the cell phone, no one raises their hand. And the reason no one raises their hand is not just because of issues about the size of the screen and the size of the keyboard and worry about purple thumb, but also the nature

of the level of the Internet access which is provided.

And I think that the different -- these restrictions create such big distinctions that, in fact, they suggest that they compete in different relevant markets, different product markets, if not at least different sub-markets, because consumers are not willing to substitute, and, in fact, these differences are also growing.

So in measuring broadband, we also have to focus on significant restrictions that ISPs impose, such as restrictions on downloading applications, application use, computer tethering, device attachment, as well as congestion policies and practices, which also affects speed.

So it's worth just taking a step back and also putting this within the regulatory framework.

So we are member that the Internet was developed and became available initially to universities and then to the public under the FCC's Common Carrier rules that prohibited

discrimination against Internet traffic.

And subsequent to the Supreme Court's 2005 decision in Brand X versus FCC, the FCC has now reclassified Internet service providers under the regulatory category of information service providers rather than common carriers, removing non-discrimination obligations.

So while some may argue that the number and, indeed, type of Internet service has proliferated since then, so too have restrictions that would have been prohibited under common carrier regulations.

So these restrictive practices have become commonplace, particularly for wireless.

So in my analysis, I wrote a paper called "Disclosure, Deception, and Deep Packet Inspection," looking at the role of the Federal Trade Commission Act in the net neutrality debate and contrasting the FTC's role with the FCC's role and also the role of antitrust.

So in this analysis, I also looked at a number of contracts and terms of services from a

number of different service providers and found a plethora of restrictions. So, for example, some wireless services allow customers to download only the applications that the wireless service provider has approved. You know, it is a fundamentally different model of the Internet than the open Internet, where no one needs permission to post an application and no one needed permission to download an application, because you can only download the applications that your carrier has approved.

So this is a very different model of Internet access. Other providers, through their contracts or terms of service, sometimes explicitly limit the use of certain applications, including peer-to-peer.

And peer-to-peer has been demonized as a marginal technology, and often characterized as people who are doing file sharing, perhaps illegally, but increasingly peer-to- peer is being used by organizations such as the National Geographic, the National Football League, the

National Basketball Association to also make some of their video available.

So it is not a marginal technology, and, in fact, what is now -- it is second to other video technologies.

Nonetheless, many carriers, particularly wireless providers prohibit use of peer-to-peer. So consumers who wish to use those technologies have to find an alternative, and even when they're looking for an alternative, some terrestrial ISPs also impose restrictions.

Additionally, many wireless providers prohibit tethering the phone to a computer to provide Internet access. So part of the reason that you don't want to substitute or some people may not want to substitute is the device attachment prohibitions, specific prohibitions on computer tethering.

Now some wireless providers do offer separate tethering plans for computers for additional fees, but they are subject to bandwidth limits and are often higher than bandwidth limits

that you might be able to get through terrestrial-based Internet service providers.

And then there's also general device attachment prohibitions. So we see this also in satellite service providers. So satellite service providers many of them are imposing monthly bandwidth limits, and I'll talk about how this is becoming common elsewhere as well.

But some satellite companies warn that if the user has exceeded her undefined fair share of bandwidth, then it will slow down the user's speed for a 24-hour recovery period.

But this slowdown will last for each 24 hours or thereafter until usage is reduced. So when you look at some of the sites where consumers are talking about their experience with this they say they wake up to find that their kid looked at a couple of YouTube videos and suddenly their speed is slowed to Fred Flintstone levels, and they get -- they feel trapped. They can't get out of it unless they stop using Internet access for a couple of days.

So these bandwidth limits are also, as well as slowdown policies, what I call slowdown policies, are proliferating in terrestrial networks, particularly cable- based ISPs where bandwidth is shared.

And these ISPs may supplement monthly bandwidth caps with undefined time period-based caps. So basically, a user can have access load for an undefined time period from downloading one high-definition video or even some undetermined amount of bandwidth, even if you don't exceed monthly bandwidth caps.

So monthly caps are not an absolute guide. So in summary, we need to look at issues like application, device attachment, usage and slowdown policies, peak average and slowdown speeds to distinguish between different types of Internet access, and, in fact, these practices indicate that they generate something which is so different that they are not actually substitutable products.

So just putting all of these things

together and saying it's broadband really does not capture the ability of somebody who lives in a rural area, for example, to use telemedicine type of applications.

So speaking of rural areas, I just want to transition into the second half of my comments, which is that we need to also measure and monitor access gaps in a proper way, recognizing significant gaps for rural people, low income people -- gaps by level of education for non-English speaking people, continuing racial and ethnic gaps in Internet access, age and disability.

So just one quick word about rural access, so one of the things that we need to be mindful of is that many of the Federal rules exclude from the definition of rural certain areas that contain a major metropolitan city.

So, in California, where I live, the sense of excluding places that are very rural farm working communities, the breadbasket really of our nation that are outside of Fresno, California.

So in a study by the California Public Policy Institute, for example, they found 285 communities in the San Joaquin region, which encompasses Fresno, lacked broadband access, excluding mobile access.

And similar numbers were found in areas near San Bernardino.

And I think the language access issue is also something that deserves some time, and I'll take a couple of extra seconds to discuss it, if I may.

This same public policy institute found that in California, 82 percent of California English speaking Latinos subscribe to broadband, in contrast to only 37 percent of California's non- or limited English speaking Latinos.

And the Pew Internet and America Life Project also had similar findings in 2008, paralleling basically the same gap at a national level.

Yet, in many of the Pew studies they don't actually interview people in Spanish. Most

of the pew studies are done only in English, so this is why I used 2000 data instead of the 2009 data from Pew, which was done only in English, and, therefore, disguise these gaps.

So from the 2008 study, we find only 35 percent access for Americans over age 65; 59 percent access for African Americans; 44 percent for non-high school graduates; and 53 percent for households with incomes under $30,000 in contrast to other groups which have much higher level of access, as is discussed in the slide, including 95 percent access for households with income over $75,000 or 91 percent for people with a college education.

So this whole issue of the methodological appropriateness of survey data gathering is absolutely critical, because in places like where I live, in San Jose, California, we have a very large Spanish-speaking population, but we also have the largest Vietnamese population outside of Vietnam. And if we're only doing surveys in English, we're going to be missing

critical access gaps.

So I will stop there, which is one last thought, which is another thing affecting access is a huge differences in computer ownership and some of these are attendant as well to some of the other issues, but we also need to talk about the hardware issues and the training issues as well as the network issues. So thank you very much.

MR. STOCKDALE: Thank you, Professor Sandoval. Our last speaker is Jon Eisenberg. He is the Director, Computer Science and Telecommunications Board of the National Academies. Mr. Eisenberg has also been Study Director for a diverse body of work, including a series of studies exploring Internet and broadband policy and networking and communications technologies.

Between 1995 and 1997, he was AAAS Science, Engineering, and Diplomacy Fellow at the U.S. Agency for International Development, where he worked on technology transfer and information and telecommunications policies.

Dr. Eisenberg received his Ph.D. In Physics from the University of Washington. Please go ahead, Dr. Eisenberg.

MR. EISENBERG: Thanks. So I wanted to do today was share some results from some past work by the Computer Science and Telecommunications Board that relates to how to think about defining broadband.

CSTB is the unit of the National Academies that does studies on computing and communications, their social and economic impacts, and associated policy issues.

And the studies are consensus work by multidisciplinary committees.

The National Academies is a non-governmental organization that dates back to the founding of the National Academy of Sciences in 1863, and it's chartered to advise the nation on matters of science, technology and medicine.

I'm going to talk about some results from two CSTB reports. The first is a 2002 report that provides a broad assessment of the landscape

and makes recommendations aimed at speeding broadband deployment. For this report, I'm going to focus on its discussion of broadband definitions. And the second is a 2009 report that looks at the information technology research and development ecosystem, the university and industrial researcher enterprises, emerging startup and more mature technology companies, the industry that finances innovative firms, and the associated regulatory and legal frameworks.

For this report, I'm going to focus on the role that broadband plays in that ecosystem.

So this is the first report. And this is the committee that authored it. This was a broad survey of broadband technology and policy, and note that a whole chapter, Chapter 2, is all about defining broadband. And it talks about multiple dimensions of broadband, and in the end offers a two-part dynamic definition.

So I think some of these points have been made already. There are various dimensions of broadband. It's not just about speed or

bandwidth. There are also quality of service measures that are relevant, such as latency and jitter.

There's the issue of downstream and upstream bandwidth, again, something that matters for certain applications. There's the always on property, which makes it possible to immediately access Internet resources, and enables background machine to machine interaction as well as human interactions.

There's the question of whether the broadband connection is shared and available via some form of home network. The technology for this is, of course, widely available today, but it's by no means deployed everywhere or used by everybody.

There's the question of addressability, in essence can I -- can my devices connected to the network, do they have unique IP addresses that can be access from the outside world. Are the IP addresses issued dynamically or statically? Are all the devices in the home aggregated into a

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single external IP address through a network address translation or not?

Today we see lots of clever workarounds that make the direct addressability issue a little less important than maybe it once was, but they do require whoever is implementing a particular service to commit additional functionality to kind of work around that. How addressability is implemented reflects a number of factors, which include the functionality versus security tradeoffs, IP address scarcity, a desire by the broadband provider to tier their services and so forth.

Several people referenced the issue of controls on applications and content, and then there's also the question of whether the definition includes just plain Internet or other service as well; that is, what' delivered using plain IP versus what's delivered using more specialized protocols and architectures, such as what broadband providers might use to deliver video and phone service today.

So the committee that wrote the study took as its point of departure for thinking about definitions, who benefits from workable definitions. So there are consumers who would like to be able to evaluate service offerings to see if new offerings are likely to meet their needs, service providers who want to develop, invest in, and deploy services that consumers will need and want and pay for, application and content developers need to understand, attract the connectivity performance options available to consumers. Policy makers or regulators seek to monitor broadband service appointment, and finally public interest groups seek to evaluate the capabilities available to consumers and to understand the implications of alternative policy approaches that influences capabilities.

So the few interesting observations that the report offers related to this. First is in this view defining broadband involves identifying the kinds of applications that users are likely to find useful and desirable and anticipate and

determining the benefits that different segments of the population anticipate from access to broadband services.

I also note that too limited a definition could result in a mismatch between expectations and capabilities. While an unrealistic definition could prompt inappropriate or poorly aimed policy interventions.

And I think finally the absence of a consensus of definitions once the risk of confusing the policy debate and requiring ongoing debates about what definitions to use.

So there report offers to dynamic function definitions of broadband. The first definition is that the local access performance should not be the limiting factor on a user's experience in running today's applications. So I'm up for sample, increasing the performance above the rate at which content is typically streamed won't improve the user's experience, although, of course, as I get to the second definition, increased capabilities would be

expected to spur higher-quality streams in the future.

Another way of thinking about this definition is that increasing performance where bottlenecks actually exist elsewhere in the network won't improve the user's experience.

So the presumption here is that existing applications and capabilities of the rest of the network will be unleashed by improvements in the local access segment. One might also think about this in terms of trade-offs. For example, for some applications one can compensate for limited bandwidth through compression or local caching such that bandwidth is not the limiting factor.

Okay, so the second definition is broadband access should have enough performance and wide enough penetration of that performance to encourage the development of new applications. So this is the cliché chicken and egg, capacity improvements in application innovation are tightly coupled.

An application isn't to be made

available until a critical fraction of subscribers receive a high enough level of performance to support it. Yet, service providers will not deploy higher performance broadband until there is sufficient demand for it.

The presumption of this definition is that application innovation and ultimately future demand for broadband will materialize if the performance constraints are eased.

So that is today we run yesterday's apps faster and the promise for tomorrow is that with increased penetration of faster broadband, new applications will follow.

And we've certainly seen many new applications become widespread in the years since broadband became widely deployed in the U.S.

These definitions suggest the adoption of application performance indicators. So one indicator would be for different applications is the performance perceived by the consumer to be improving or deteriorating, that this is a measure of whether by my first definition services

available are actually broadband. This is an easy, of course. The sound metrics of performance and means of monitoring new trends would have to be developed and agreed to.

Another indicator would be are new applications that depend on high bandwidth emerging? If they do not, that would be an indication that by broadband definition two the services being deployed aren't broadband.

Okay. So let me quickly turn to the second report. And this is the committee that was responsible for it.

This report also had a broad scope, of which broadband was one element. As you can see here, the report laid out a whole ecosystem for information technology research and development, and it identifies broadband and also mobile as key infrastructure and a key player within that ecosystem.

So -- let me skip that one. So one of the four or key objective to come out of this report is to ensure that the United States has the

infrastructure that enables U.S. IT users and innovators to lead the world.

So the argument is the U.S. has long enjoyed the position of being the largest market for IT, but this will not persist as growth occurs around the world. And also, in the future, innovation will go where there are technologically sophisticated users, leading edge product requirements, and the infrastructure, including broadband that supports innovation, some of which is customer led, which requires access to the best infrastructure, which includes broadband. The report goes on to observe that the U.S. has been losing ground compared with other nations, and concludes that the U.S. should establish an ambitious target for regaining and holding a decisive lead in the broad deployment of affordable broadband services.

So underlying this is what one might think of as another dynamic definition, what it means to be world- class. That is, setting and reaching ambitious target would enable the U.S. to

keep -- to leap well ahead of other countries and hold that lead for some time.

The report argues this would have significant benefits for the U.S. IT innovation ecosystem. And it notes as one example of such an ambitious goal one gigabit per second available to 100 million homes and small businesses by 2020.

Let me stop there and look forward to the question and answers.

MR. STOCKDALE: Thank you, Dr. Eisenberg. And I wish to thank all of the panelists for their thoughtful presentations.

One thing I took away from your presentations is that the Commission's task in establishing measuring benchmarks will not be easy. There are a number of possible dimensions and issues that we may wish to measure and trying to determine how best to measure them and how to deal with the variations, both geographically and among socioeconomic groups may be difficult.

I take particularly from Dr. Clarke's presentation that there is sort of a need the

Commission will -- that the Commission will have to balance the sort of desire to measure and reflect real-world complexity against the need for relatively simple and measurable benchmarks that will be relatively stable over time.

And so what I'd like to do now is to talk about some specifics to highlight the tension and to get your thoughts. And, if I could, I'd like to start with the issue of price, because price is relevant for determining -- or it may be relevant in assessing whether broadband is affordable.

So if any of you have any thoughts about how the Commission would go about measuring the price of broadband, particularly given the differences in types of broadband, I think we'd be interested. Mr. Feld.

MR. FELD: I did try to touch on that at this a little bit in, you know, in the presentation. It's one of these metrics that I really think you're going to need to break down on to regional levels with reference to personal

income. My preliminary thought actually at the moment is well, number one, I agree with Professor Sandoval, that we need to be very mindful of the gaps, and we're going to have to track where the gaps are and that will be a first correlation.

Right now most of the studies do seem to have shown a strong correlation between low income and low adoption, suggesting that affordability is -- that price to the end-user, and, therefore, and, you know, affordability is a factor in adoption, and therefore, I would argue that in the statutory term of accessibility and of affordability.

I think that at the moment the likeliest is to do this by census block basis, because there is available census block data of average income within the census block, and we can track advertised price in an area within a census block.

So there's at least some correlation there. That may just be a preliminary metric. You may need to actually go down to do surveys once you've identified particular blocks with

regard to pricing to see if people are getting, you know, particular deals, the bundling questions that were raised by Richard Clarke and others as to how we're going to track that element of price.

But even when we consider whether two -- you know broadband versus broadband plus phone plus all of these other things, I do say that at the end of the day a key factor in affordability has to be within the measure geographic area can people in that area actually afford to buy it, and it will do us no good to measure broadband is separate from other elements of a triple play bundle is the only service that is offered within an identified geographic area is the triple play bundle.

MR. STOCKDALE: Assuming that we adopt your proposal and try to sample prices at the census block level, how do we do with the fact that there may be different offerings and different speed offerings and that with respect to a particular offering you may have an installation charge or a free TV, a promotional period at a

lower monthly rate, and then a higher monthly rate and possibly early termination charges. How do we come up with a simple metric there so that we can?

MR. LYNCH: (off mike) -- just additional characteristics. You had this very long factor of, you know, product characteristics of what exactly this broadband thing is, you know. I mean it seems to me you have to address the or somehow figure out some way of addressing all of that simultaneously, and then on the other side you have the, you know, I know some number in dollars, you know, if you're going to go for affordability, you have to know what exactly these services that you're buying.

MS. SANDOVAL: Price does not (inaudible) in a relevant market. Substitutability and the characteristics of the product define the relevant market, right? So you have to look at our these products comparable in light of very significant restrictions, very significant differences in quality of service which can be measured through many different

dimensions, including application and bandwidth restrictions.

Then you ask given these various restrictions if the price of one grows, would you substitute. The price itself doesn't define the relevant market, you know, aside from what you're talking about tying, et cetera, bundling also affects price.

But another dimension that I'd like to suggest that we need to think about his access to credit as well as access to bank accounts. And I think that it's something that's been under studied, especially for low income households, that to the extent that broadband service providers are requiring credit cards or credit checks or even bank accounts that there are a lot of people who don't have these things, and so I know with some work that I've been doing with the Social Science Research Council one of our grantees has been working with garment workers in Los Angeles, and they really rely on pre-paid cell phones. And they do that in part because they

don't have credit cards, and they don't have bank accounts.

And they don't have Blackberrys with Web access. They use the calling feature the cell phone and they use texting. So, again we have to start with focusing on what are substitutes as opposed to trying to have price to find the relevant market.

MR. STOCKDALE: Dr. Clarke.

MR. CLARKE: Given the writing of different uses that people may have but the need to keep the task manageable when I would probably suggest is that you define a few profiles of usage of what is an example of what we think of as entry level usage, what's mid-level usage, what's kind of, you know, college state of the art or geek type usage, and, you know, track what, you know, you'd make a profile of what are the characteristics of use of those individuals, making sure that they are accurate, really reflecting that really that type of use, and track a few of these profiles.

But, you know, also pay careful attention to what's the -- you know, what's the relative prevalence of that particular usage profile within the economy, because often there is people always want to talk about well, what's the fanciest, most whiz-bang type of usage, and yes, maybe we hope everybody will get there, but, by and large, most people do have only very basic uses for Internet. And the problem with all of these meetings that talk about broadband is that pretty much everybody in the panel, everybody in the audience is at the 98th percentile or higher in the intensity of use they make of broadband.

And it often, you know, they forget that there's many other people around who have very different use profiles from themselves.

MR. STOCKDALE: Dr. Rosston and then Mr. Feld.

MR. ROSSTON: So I think the question about price, you had very different responses. And I'm trying to tie these together. One of the questions about prices how do you measure it.

Well, it depends on what you're trying to -- what your goal is. And if your goal is for assessing affordability, then I think that what Mr. Feld said has a lot of good things to it, to think about what is it. If we're trying to figure out can people afford it, we need to look at it on a census block basis, what the prices are in those areas, and in that respect taking -- building on what Rich said and work that I've done on the low-income telephone demand stuff, we tried to develop a minimum price for the service, and if you want to think about whether the minimum price includes a bundle. If most of the low income people still do take cable television service as well, then you want to include it as part of the bundle.

If the vast majority don't, then you'd want to say what's the lowest price. You'd want to amortize the cost of the hook-up charge based on maybe an average tenure or a slightly less than average tenure in the household.

We've tried to do this in our low-income

household work as well. And so I think you want and try and figure out -- at least if that's your goal, what's affordability, you'd like to say what's the lowest price people can get it at in that area.

If, on the other hand, your idea is well, we should have a price index to figure out what's the competitive level or what -- you know, what's happening to prices overall, then I think what Ms. Sandoval has had some reasonable thing is what is in this competitive basket in what are you thinking about. Should you have different price indices for different types of services and see what happens to them over time. Maybe there's an average price of something that you want to get that may not just be the lowest price if -- or maybe it's the most prevalence price that's charged as opposed to the lowest that price. But so, your price index has to be tied to a specific goal of what you're trying to measure.

MR. STOCKDALE: And does it not also in order to deal with sort of a dynamic stability

over time, does it not also have to be tied to a certain speed or quality characteristics?

MR. ROSSTON: I think you'd want to correct for that. I think that's the difficulty of an index. You may just want to measure what the affordability of something, for example, on the lowest price if you're getting more and more for this lowest price, it may show that it's increasing substantially faster than the rate of inflation. But quality adjusted, if may be still a very good deal.

So I think you're absolutely right. You need to take that into account.

MR. STOCKDALE: Mr. Feld, do you?

MR. FELD: Right. Let me just respond quickly to a couple points. One, I am sorry. There is no easy metric, and so the fact that the pushback on this level of complexity of the service and the service offerings is that well, you know, how do we reduce that to an easy metric. Some of the answer to that is you can't, because these things are so use-dependent, and, therefore,

to a certain extent, the collection of information and the information that you put out there and that is available is, in fact, going to and form based on what our ultimate goals are how we slice and dice it where I again come back to don't try to do this alone.

You will make a first cut on this for yourselves of based on the ultimate understanding of the terms in the statute what you had to link these to. You should expect and encourage that others will be looking at this problem over time will note that depending on what we mean by price, it could mean these different things, and we will see a body of research that emerges that helps us to understand this over time.

We need to recognize we're at the very beginning of this and that we have to take a cut now and watch our knowledge evolve, rather than try to, well, put this into a nice mathematically tractable package at the moment.

Some of the issues you raise with regard to how do you differentiate this will be solved by

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what is your definition of broadband, because if the question is is the broadband affordable, the first question was, what do we mean by broadband, and if we adopt a definition of broadband which says, well, it has to be able to support these sorts of applications or functionalities or it needs to have this measure of reliability or whatever it is that we decide is the appropriate measure of broadband, some of the questions about well, then how do you measure price go away.

And the last thing I do need to make a point with regard to Richard Clarke's comment about how everybody in this room is -- or not everybody in this room but generally these conversations are held by people who are techno enthusiasts and, therefore, you know, don't necessarily reflect population need at the moment.

One of the purposes of the statute, a goal of the National Broadband Plan, is to drive to the maximum efficiency of the network and the maximum use and utility of broadband so that it achieves the listed social roles.

So to the extent that we're saying we don't need to worry too much about certain capacities in our definition of broadband or in our pricing because most people just uses for e-mail, then that is actually a problem under the statute, I would argue. And part of the question of pricing then is well, okay. Is there a problem in pricing so that people are not using this in a more efficient manner?

MR. STOCKDALE: Does that not suggest, however, that you would -- even given a particular definition, whether it's five megs or whatever that you may want to monitor and measure the price of high-capacity services towards which people will be transitioning over time to see how those prices evolve?

MR. FELD: Absolutely.

MR. CLARKE: And I think that's what I suggested. I said you should have profiles that are both low use and high use and but just it's important to keep account as to how many people are in each group.

MR. STOCKDALE: I don't want a mock-up. Yes, Dr. Eisenberg.

MR. EISENBERG: I mean profile setting is a little bit tricky, and I think of, you know, a few years ago, you were pushed into a business class tier if you wanted VPN access. Whereas, today, that something anybody needs to casually check their work e-mail from home. And so the definition of what was a basic tier today is not what the basic tier might be tomorrow.

MS. SANDOVAL: My study also showed there are a lot of users who, in fact, subscribe to the highest price tier that is available by their Internet service providers, yet still confront significant and often surprising to them restrictions because there -- it's not just that they're inadequately disclosed. They're inadequately defined.

So you never know when you're going to cross that magic moment of I am exceeding my bandwidth use, which is undefined at this moment. And so once again I urge you that price is not

what drives the definition. We have to look at the quality of the product characteristics and in what is charged for that.

MR. STOCKDALE: Let me follow up with one last one question, which your comment suggested. I would imagine that it would be possible today with today's computing power to do a survey in which you acquired information that included all the price variables of every offering of every broadband provider in every census block in the U.S. And you can also include the sort of product characteristics at least as described on the website and any restrictions in usage as described in the consumer agreement.

And we'd have a very big database. But it isn't clear to me that that would be usable. And one of the things that I think that we're trying to do is to be able to develop metrics that do reflect the complexities that you identify but that we can actually use to see whether progress has been made and whether the Commission is meeting the goals set forth in the Broadband Plan.

So.

MR. ROSSTON: Academic researchers would love you for doing that.

MR. FELD: Which I do, you know, again come back to is you will collect far more information than you will at first be using, because you cannot do this alone. That includes both federal agencies, you know, certain expertise can and should be offloaded to other agencies that conduct surveys and would include a broadband aspect to this generated behavior. But in addition, as Dr. Rosston said, you know, academics would love it, and that would contribute to the development of better metrics as other people were able to play with this and observe what the correlations are to things we care about.

MR. STOCKDALE: Thank you. I don't want to monopolize the questioning, so let me give others a chance.

MR. MAYNARD: Yeah, I really enjoyed the slide from Dr. Clarke on measuring broadband performance. It was a great summary of the

discussions that we've had internally on how to look at speed, but also other metrics. You mentioned performance characteristics can be very complex. Separate reporting for each characteristic is problematic. Creating an index is delicate. And then you mentioned some of the limitations of polling end-users and so that and that is pretty much where we stop our own conversations.

And I was very saddened to see that the next slide didn't have a perfect answer for us. That was our hope.

Without pinning anybody to name a number on speed or price or anything, I think what we're looking for on a task force is suggestions on where we go from here. I mean we've had these discussions about indexes, what the limitations are, the usefulness of polls, what their limitations, et cetera. And I'm just interested to hear from some of you to think about okay, the data is limited. The process is shortened. How do we do the best we can to -- so the policy comes

out right.

MR. CLARKE: Well, I think there was fairly general agreement across several panelists that the best way to do this is to look at, you know, the idea of what uses do we want the Internet and people's broadband connections to support, and start off with those uses, and based on those uses try to develop a, you know, a profile of what network quality characteristics or performance characteristics are required to support those uses, and to focus on kind of building it from the bottom up as opposed to the top-down saying, well, I want a round number of number of megabits of peak speed and instead try to figure out well, what capabilities do we want to support, and use that as a guide for well, what is -- what are the importance of these -- relative importance of the different network characteristics in supporting the ability of customers to use, to engage in these uses.

Unfortunately, I can't tell you what exactly the collection of users should be. We're

taking that can over. Maybe do a different do a different panel. But.

MR. ROSSTON: So there are -- I'm not going to answer your question either, but for quite a while people in cellular tried to come up with a price index. Econ One did this survey every quarter average six months -- I can't remember where they said, what does it cost in 25 different cities for 100 minutes and 500 minutes and 1,000 minutes of use.

I'm making up the numbers, because I don't remember exactly. But they had a specific number of minutes of use, and partly you might do what we all sort of suggested is sort of certain capabilities to get things done, but that may end up saying, well, what's the price for 5 megabits a second. What's the price for 20 megabits a second. What's the price for 50 megabits a second?

And there may be for some of these extremely high price, because you have to get special access or something like that.

But it gives you baseline and then you can take these things over time if you have high enough levels that those will evolve to -- over time, where there will be prices for these, for residential services, and you'll see them over time and that will give you the ability to compare overtime what's happening. But to try to come up with, or as Rich says, different profiles of users and figure out what these prices are.

MR. BERENDT: Well, I think one of the issues to keep in mind as well is that this is an involving process. And we need to, at this point, figure out maybe what the bottom is and at least start there because five years prior to where we are -- or in 2004, the uses and applications were completely different or in many ways very different than today.

And the need for the capacity is far different today than what it was. And the same thing is going to continue to happen as they years progress.

So I think one of the main -- what's

critical is just to at least begin where, you know, the consensus is right now. And I know that may be not answering your question again, how do you come to that consensus.

But certainly compiling what the primary needs are at this moment, and at least beginning there to create a floor, at least, and then you can -- because you're going to need to continuously evolve it as the world changes and as the, you know, capacities and applications change.

MR. FELD: I would add in light of Scott Berendt's comment that in fashioning the definitions, we may want to actually move towards the most -- how I say this -- the best efforts broadest based type connection that is supportable in terms of our definition of broadband and what is out there, which is how the Internet got us into this in the first place of being concerned not with supporting particular applications, but of supporting the ability to develop and communicate on these applications so that in terms of, you know, trying to define both broadband,

and, as I say, the nature of the things that people are doing.

With regard to the broadband connection itself I would suggest that we want to evaluate it in terms of its overall utility and use for the ability to support the maximum number of uses rather than looking at how people are using it at the moment and decide that we want to maximize the current uses.

MS. SANDOVAL: So I think also what Dr. Rosston was saying about, for example, looking at the cellular telephone industry and then the price index where we're looking at, you know, price or minutes of service, for example. You also have to remember that they are subject to common carrier regulation. They're not for texting, but that's part of what makes them comparable.

Whereas, when we're talking about Internet service providers that are now subject to information service provider regulation, it is part -- that's part of what has fostered this proliferation of restrictions.

Now some people would argue that it's okay to have different types of services with different types of restrictions, but my point is that they are different types of services. They are not all the same, and so, you know, I think that we should be focusing not just on, you know, what the user wants to use, but sort of the types of restrictions that create a fundamentally different type of product.

So I think when your ISP is defining what applications you can access and what applications could be transmitted to its customers that is a fundamentally different model of the Internet itself and a fundamentally different model of Internet access.

And so I think it's possible to get to a variety of those types of things that actually so fundamentally change the characteristic of the product that you're looking at different relevant market or at least a different sub-market.

One just last comment about polls. So, again, we have to be careful that we are not

simply pulling people who are online or even polling people who have cell phones because, you know, while it's -- among low income people cell phone use is increasing, you know, as I said, with a lot of low income people, they're just getting prepaid phones and they don't have Internet access. So we can't just ask people with Internet access about their Internet access, especially when we see some of the statistics -- only 58 percent of African Americans have broadband access; 32 percent of Spanish speaking people have broadband access. Very significant differences.

So to the extent that we do polling, we also have to spend some times with these underrepresented groups. And I'm on the Board of Expert Advisors for the California Emerging Technology Fund, and the state legislature has given some money to try to foster broadband and deal with some of these access gaps, for example, also for the disabled, low income, rural, and underrepresented groups, including minorities and non-English speaking.

And what they've found was -- in working with several of the grantees is again gaps in access to hardware, computers, you know, credit issues and also training issues. So there's a lot of issues that drive the usage side, but then all of these issues that drive from the carrier what services you're being offered.

MR. EISENBERG: Yeah, I was just a comment. I mean if you buy the dynamic definition of the two definitions that I gave you, then you probably want to do something to measure the uptake of new applications, new more demanding applications. And I will again not answer your question by telling you how that can be done, but that seems something worth measuring or monitoring in some way.

MR. BERENDT: And if I can add, building off of what Harold Feld was saying, is certainly in areas where they're underserved or unserved. I think it's critical not to put in the minimum at this point because in the coming years that minimum will be then be obsolete, but to try and

implement in those areas where they currently are maximizing broadband what is the more advanced. So they're in a few years they don't need to be retrofitted again and then it's more money, you know, good money after bad so to speak.

MR. STOCKDALE: Dr. Lynch or Professor Peha, do you have any questions?

DR. PEHA: All right. I'd just like to follow up a little bit on Nick's comments or Nick's question on understanding the quality of this service.

I heard a few interesting ideas here. I'm not sure how many I'll have time to push on, but to -- I guess one of them Harold Feld said a couple of times that we should be making use of other entities. I can't remember how you said that -- to collect this data. I'm -- part of me -- is dying to ask you about the technical aspects of that, but let me ask about a couple of others.

One is financial sustainability. Can we believe that there will be entities out there who will undertake this thankless task for the

long-term, and the other is sort of credibility. How do we make sure that either accidentally or deliberately one of these entities doesn't slant from -- towards one provider or another?

MR. FELD: These are all very good and very important questions. I touch on them briefly in the written statement. But I would first start with an observation that you have a lot of private-sector companies that make their living doing these sorts of things.

We do the Consumer Confidence Index as a survey of people. We -- Nielsen for over half a century has been doing user diaries and other methods that ask people to make simple records in real-time, and the reason it's sustainable is because you break it down into something fairly simple and you shift your people around, and you do represent a sampling rather than everybody.

And in fact, what Nielsen has discovered is that people like being in homes because they think they're doing something important. Now there is to some of these a user effect that you

have to account for. If I know that Nielsen is going to, you know, keep my favorite show on, I will, you know, watch it constantly on my Tivo or whatever so that I drive up.

But people are sophisticated about that, and they have learned how to process these things. I do come back to the possibility of developing applications that volunteers would download that either make it more feasible for users to do real-time reporting. You know, you just have a little window that comes up every now and then that lets you Tweet or send a text message to the FCC answering what am I doing now with my broadband. Or applications that reside within machines that are downloaded by volunteers. You'd need certain safeguards for privacy or, in the case of working with businesses for -- to protect proprietary information, which simply monitor and report certain functions.

And those are reliable because you develop the apps in a way that ensures the standardization of reliability.

MR. EISENBERG: I mean just one other thought, and it's got also to problems in it, but lots of applications already do their own monitoring of the network; right? So streaming applications negotiate an optimal band -- you know, data rate. Of course, that reflects not only the local link, but other things. So that's an issue. You know, i-Tunes knows how long it took you to download a song or a video.

So you might be able to use some aggregation of that sort of data to give you some indicators. But there are all sorts of problems in that as well.

MR. FELD: And I will add that one of the areas we haven't talked about which will be more critically important is the machine to machine uses of the network. And to the extent that, as I say, you imbed some of these monitoring functions or other ways to capture what will be an increasing amount of machine to machine Internet traffic so that we can observe what will be an increasingly important aspect of economic and

social welfare aspects of this; but that's something that really we can't be overlooking here.

DR. PEHA: One other interesting suggestion here on the same front that I'll push on. I guess Richard Clarke pointed out that lots o people have pointed out that there are lots of characteristics you might want to use. As you said, separate reporting of everything is complex, and an index is delicate and you have to define weights. And I just wonder if anybody knows of any credible attempt to create an index that might actually be useful.

MR. FELD: The closest thing -- I mean there are pieces of this floating around, and actually I will mention that one of the things that kind of -- a meta project in this and why I think we need to bring in more people who actually study informatics as a field of its own rather than all of us who are coming from particular fields, which, you know, come to what is the important information with a particular bias.

The -- as Eser Hargittai has been trying to collect -- created database of surveys so that we could actually have some standardization along this very subject and find out, you know, what questions people have been asking and what indices people have been creating, because everybody does this from scratch when they do this.

That said, I do suggest that the USDA's recent release on the importance of broadband to rural America, which contained at least some effort to measure the economic benefits of broadband introduction was one approach that struck me as of the more useful that I've seen so far in terms of how you get to these impact questions, which are critically important to whether we are actually achieving what the statute wants us to achieve with broadband.

DR. PEHA: I guess I meant even -- helpful in more narrowly. If you can do that, that's phenomenal. Even the more narrow question of whether you can get the quality of a particular link as an index is a challenging issue.

MR. CLARKE: Well, I think a way that this might be done is again, using a certain amount of social science techniques of giving people services of particular qualities and asking them how did this work, just overall, how is -- did this workout for your type of uses. And then if you have, you know, have enough of these laboratory rats and different qualities of service that you can infer back an implicit set of relative weights that people are putting on these things and I think this was -- you know, when Bell Labs was a very huge organization, they had all sorts of human factors research on well, how long does latency have to be -- this is the talk about PSTN to before it gets bothersome and what type of frequency response do you need and so I think there is a history of doing things like this.

But again, it's an elaborate research project.

MR. ROSSTON: One thing that you might want to think about is updating the database that Savage and Waldman used in their paper, the 2002

data that they got on the value of broadband, and the papers that they've written. You may -- it may be very useful to try to update the data and do more surve -- it was a survey-based paper, and I think updating that would be useful.

MS. SANDOVAL: Yeah. So I think we also have to think about when you get information from the carriers, when you get information from the user, when you get information from third parties.

So, you know, if we talk about user perceptions, one of the issues is, for example, sometimes the users don't actually appreciate what's going on, because it's disguised. And so now sometimes the latency which may be created by congestion management policies may be so small that people really don't notice.

Now in certain other services, people are noticing, and I can tell you where to go on the blogosphere to hear what they're saying and especially where when you use too much, and you end up in this penalty box that lasts for, you know, at least 24 hours if not several days.

So user perception is one thing, but it doesn't really capture often what's going on. So, for example, with the whole peer-to-peer interference issue, one way of finding out what was going on was using some of these applications and actually the Max Planck Institute in Germany made available some very interesting applications that became downloaded all over the world. Again, part of the question about that becomes methodologically is it really representative, but those applications can be useful.

So but as much as deep packet inspection technology is criticizing the number of fronts -- it has some privacy issues. There are various and sundry criticisms that have been used against it, the reality is that many carriers are employing it, and they know exactly what's going on across their network.

So, you know, when you look at some of the best sources I've found were actually from the DPI providers who've written papers, you know, like Sandvine and PeerApp, and they can tell you,

you know, here are the types -- here's the protocols or applications that are being used.

Now they can -- they only put out so much because they have contracts with the ISPs, but the carriers know what's going on in terms of what people are using. The carriers also know what they're doing in terms of slowdown policies that are not necessarily explained full in those terms of service.

So we have two really look at getting sources for multiple dimensions, including when these carriers are employing sophisticated technologies that are giving a lot of data how can we ask them to report on what they're doing with that data. For example, it is through DPI that they implement some of the slowdown policies that they implement.

MR. BERENDT: I'd also like to bring into the conversation as well is populations that -- I mean right now we're talking I missed about users, you know, people who are online and using and what their, what the feedback might be, and

that's going to be certainly valuable. But I think there's also a component of a digital literacy and digital awareness component that needs to be a part of this that I know that's hard to capture, but those elements I think need to be enhanced, because that's going to change or at least influence what the results are.

People you become more familiar and more acquainted with what's out there and what's valuable for their lives. And, as such, that will influence what results are received, and it will be different, you know, and necessarily from someone that is a much more nuanced user of the network.

MR. FELD: Let me provide one example that illustrates this point: We've been doing e-Rate now for, you know, over 10 years. We have a pretty good knowledge of how many e-Rate, you know, how many folks have applied for e-Rate, how many schools are -- and libraries are connected with e-Rate.

We have no knowledge whether e-Rate has

actually made a difference to educational outcomes by any measure, because we don't know if e-Rate is resulting in schools that are training their students to use this stuff or schools that have a connection that they do not train their kids on, because they don't have laptops or they don't have people who can actually train the students to use the broadband effectively.

And I think that one of the things that we desperately need to do as we are examining whether we are meeting the goals of the statute is if our initial series of benchmarks triggers us to look at things, then we need to start asking why they're happening. So, if we're looking at low adoption rates, for example, and we see adopt -- and we decide adoption rates are important and they don't change, we need to cast a very broad net to determine if they're as a result of things like the lack of training, the lack of equipment access, and not simply, you know, are back to something else that we're already measuring like price and assume it's affordability.

MR. MAYNARD: So I had a question about one of the last slides in Dr. Eisenberg's presentation where you're laying out some of the long-term goals for the National Plan -- it was 100 Megs available to 100 million homes and small businesses by 2020, which I think would bring us in about eight years behind South Korea, but it's still a long-term goal for the United States, an important one.

I was just thinking through -- about how should the Task Force balance these sort of big idea, long-term efforts with short-term getting -- you know, target populations in certain areas or certain demographic groups onto the net as quickly as possible. How do we look at the trade-offs, the costs and benefits, as Professor Rosston talked about in thinking about these goals and prioritizing them.

MR. EISENBERG: Right. I mean so that -- this framework really tell you about benefits and not costs, and that committee's recommendation is admittedly a leap of faith, okay? But it's a

leap-and the argument there would be that it's a leap of faith within a critically important component of the U.S. economy. And so that the benefits and not just the individual benefits to the consumers, the users of broadband, but broader economic contributions; that is, that it provides an essential enabler of innovation.

But I don't have a quantification for that. It's at the end a bit of a leap of faith.

But it's also -- it's sort of like how you decide to invest in lots of things -- how much should a nation invest in R&D? There's no great empirical way of determining that and one of the things you do is you benchmark yourself against your competitors.

MR. STOCKDALE: Yes. Well, before I ask a couple of questions from the audience, Ken, do you have anything since you will probably be responsible for writing the data request and cleaning the data and then presenting it?

MR. LYNCH: I didn't want to change the subject too much, because it's -- I had -- I

didn't want to pick on Mr. Feld too much, either, too.

But one thing I do want to -- I was reading through your comments and I thought they were really interesting, and one thing I did want to ask about -- and we haven't really talked about -- so we talked a little bit about what we think broadband is and, you know, how much it might cost and what characteristics that might have. But we haven't talked about what are the other parts of the ARA which talks about availability.

And you were critical, to some extent, of the Form 477 in your comments, and I'm wondering if we should give up on that effort, because it would save a lot of people a lot of time. You know, we just didn't collect it anymore -- not just me, but, you know, the carriers.

And if we would go to some other methodology for determining, you know, which particular hen houses and, you know, every last domicile -- to the extent to which every last domicile has access.

MR. FELD: I am critical of the Form 477 and meaning no offense to the folks who devised it. But it doesn't provide data that is particularly helpful for this purpose. Now it might be helpful for things like the national broadband map, which are a little more static, which we're not going to -- you know, kind of post in real- time, you know, every new address it comes online, although, again, depending on -- you know, there is nothing other than, say, the Fourth Amendment, which stops us from requiring every carrier to report back to the FCC everybody who's connected, and, God knows, when the government wanted to get that information for purposes of come you know, monitoring for terrorists, they were able to get it.

But I do think that we need to distinguish a couple of different things. We need to distinguish mandatory reports that are good for some things and not for others, the question of benchmarks, the things that are going to tell us in a way that is valuable whether we're on course

to achieve the National Broadband Plan is very different from some other uses of data collection. That said, I do think that getting twice annual reports that are compiled that aggregate a whole bunch of information in ways that are -- that the aggregation process itself may lose valuable trend data is just not -- is just not helpful.

And everybody hates doing it. And while, as a good public interest guy, I don't mind about imposing burdens on industry, if it gets us something, there is something that offends me about wasted time. And so I would actually, you know, suggest that to the extent reports can be automated, to the extent that these forms may be easier to fill out on a weekly or monthly basis, because you're not pulling together all this information and trying to, you know, come up after, you know, six months, sit down there, you know, kind of like your income tax form input this and put this together, if you just, you know, as I say, if you file in real time, if every time you do this, you just, you know, filled out, and it

went right into the FCC's database or even on a weekly basis, you could minimize burden overall and you'd have better, more timely, and more accurate information.

MR. STOCKDALE: I have a question here from the audience, which is, "Would it be useful to include a question about broadband use or access in the upcoming 2010 Census? This may -- there may be time to devise a question, probably only one is possible, and get it in. The precedent is there, and the purpose to easy to justify."

Any thoughts or comments?

MR. ROSSTON: Working with Census data on (inaudible) telephone things is tough. I think it would be fantastic to have questions on broadband included in the census so we have -- and then supplement it with the ACS.

MR. STOCKDALE: And any suggestions about the questions?

MR. FELD: My one suggestion is that we -- you need to make the question or questions as

simple as possible. I mean the -- and even a do you have broadband connection is not a good question, because a consumer, you know, a person filling this out is probably not going to, you know, have a good definition of what that is. We can't come up with a good definition of what that is. So, you know, putting something like that, which sounds like a good idea, this isn't like a telephone connection, where you have it or you don't have it.

The -- so, to the extent we're going to have, you know, questions about it, I would urge that they be oriented towards simple, easily understood, factual things that take useful, small quantifiable measurements that would make sense for the kind of data that we are connecting.

Some of them might be, for example, more oriented towards use than actual connectivity. Have you bought something, you know, from, you know, using, you know, and have you bought something using an Internet connection or however we might try to phrase it. Has, you know, if

there is child in your household, has your child, you know, done a homework assignment using the Internet.

Those kinds of things may be both easier to collect and provide data that would otherwise be more difficult to come by here.

MR. EISENBERG: And just a quick comment. You don't have to necessarily do this in the decennial Census. You can do this in the Current Population Survey, and NTIA regularly commissions such questions as part of that survey. It also give you much more frequent information.

MS. SANDOVAL: I believe the Current Population Survey is how we've gotten some of the information on the lack of computer access, and so that is useful. But like, for example, currently the Census asks both about do you have a telephone as well as now do you have a wireless phone at home. So if we were to ask questions about Internet access, again, the whole question of what is Internet access, we might to want ask questions about how are you accessing the Internet. What

are you using in order to get there.

MR. STOCKDALE: Any final questions or comments from the panelists? If not, I want to thank you for your participation. I've found this panel extremely interesting and thought-provoking, and I invite you, if upon further reflection you have additional bright ideas or suggestions, to submit them to us. We are -- we would welcome them. So thank you, again. And with that I think that this session is closed.

(Whereupon, the PROCEEDINGS were adjourned.)

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I, Carleton J. Anderson, III do hereby certify that the forgoing electronic file when originally transmitted was reduced to text at my direction; that said transcript is a true record of the proceedings therein referenced; that I am neither counsel for, related to, nor employed by any of the parties to the action in which these proceedings were taken; and, furthermore, that I am neither a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

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